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Geospatial delineation of organic carbon deposition and degradation hotspots on continental margins

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Continental margins can be sites of preferential storage of terrestrial and marine organic carbon (OC) or areas of enhanced remineralization, but the sparse availability of data hinders the capacity to identify the role of different continental margin settings. The Modern Ocean Sediment Archive and Inventory of Carbon (MOSAIC) database [1] was recently established to compile and curate data on the OC content and its composition in continental margin sediments. This database is continuously being developed and presently includes > 60 % more published and unpublished data. Using this new database in combination with geostatistical techniques, we aim to locate sites where the deposition of fresh or old OC preferentially occurs, to identify sites of enhanced OC degradation, as well as to constrain the factors that drive these processes.

A spatial clustering algorithm was applied to data on OC abundances (%OC, n > 8000) and radiocarbon contents (expressed as fraction modern, Fm, n > 2000) from surface continental margin sediments in order to identify clusters with statistically significant high (hot spots) and low (cold spots) OC and Fm values worldwide. We identify that hot spots of OC can be separated into areas with high Fm (new OC) or low Fm (aged OC). Hot spots of new OC occur in areas with high primary productivity that supply fresh OC and in oxygen minimum zones that prevent its degradation, acting as sinks of marine OC. In contrast, hot spots of aged OC occur offshore rivers and in high latitudinal settings that receive large amounts of aged terrestrial OC, acting as sinks of terrestrial OC. In the case of OC cold spots, they are generally characterized by low Fm, and occur in broad shelves where continuous cycles of sediment resuspension and redeposition promote OC degradation. This spatial analysis sheds light to the different settings that promote the sink of terrestrial or marine OC, and identify sites of enhanced OC degradation, which helps to understand the role of continental margins in the global carbon cycle.

[1] Van der Voort, T.S., et al. (2021). *Earth Syst. Sci. Data* 13, 2135–2146. doi:10.5194/essd-13-2135-2021